

**Abstract**

5 A channel sounding system employs orthogonal sequences to meet the Cramer-Rao bound in estimating the channel and achieves considerable simplification of the structure necessary to perform the channel sounding. These advantages are achieved by developing orthogonal sequences of substantially arbitrary length as a function of first and second existing orthogonal sequences and using such orthogonal sequences for channel sounding in lieu of M-sequences. The techniques of the invention are especially suited to systems that use multiple antennas at the transmitter and multiple antennas at the receiver, so called multiple-input multiple-output (MIMO) systems.